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# ENHANCED VOLUME PHASE GRATING WITH HIGH DISPERSION, HIGH DIFFRACTION EFFICIENCY AND LOW POLARIZATION SENSITIVITY

## Background of Invention

- The telecommunications industry is growing at an explosive pace as a result of the expanding need for the transmitting and receiving of greater amounts of information. The industry, in order to meet the needs of the market, has developed a number of technologies that make use of the inherent broadband capabilities of fiber optics. One of these technologies is Wavelength Division Multiplexing, or WDM.
- WDM allows many signals to be transmitted simultaneously along a single optical fiber by sending each signal on a different carrier. Each carrier is a light beam of a slightly different wavelength than that of all of the other carriers. In order to combine these individual carrier beams into a single beam at the input of the fiber, an optical multiplexer (MUX) must be employed. To separate the carriers at the receiving end of the fiber, an optical de-multiplexer (DEMUX) must be employed. To be effective and economically practical, a MUX or a DEMUX must be capable of separating a multi-wavelength light beam into its individual wavelength components with a minimum amount of insertion loss and a minimum amount of Polarization Dependent Loss (PDL) and be relatively inexpensive and relatively compact.
- The primary function of a DEMUX is to separate the carrier beams by wavelength. There are four basic means of providing this function: (1) thin film filters, (2) arrayed waveguides, (3) fiber Bragg gratings, (4) diffraction gratings. Thin film filters use multiple filters, each tuned to a different wavelength. Separation occurs at each filter along the light propagation path. This method is effective for systems with a small number of channels (one channel corresponds to one carrier wavelength). For systems with large numbers of channels (100 or more) thin film filters are not suitable because the insertion loss is excessive and the overall system becomes too complex.

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